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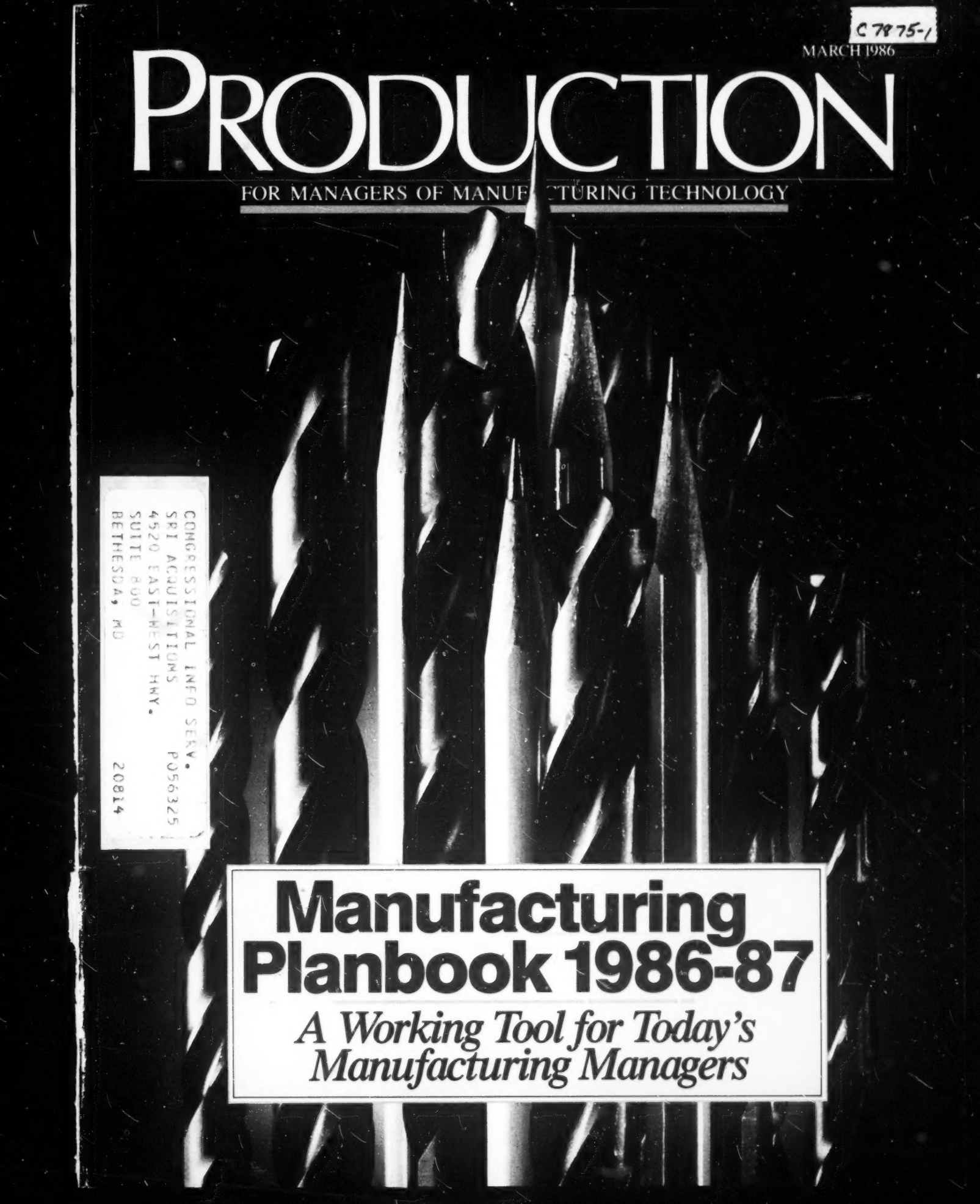
MARCH 1986

PRODUCTION

FOR MANAGERS OF MANUFACTURING TECHNOLOGY



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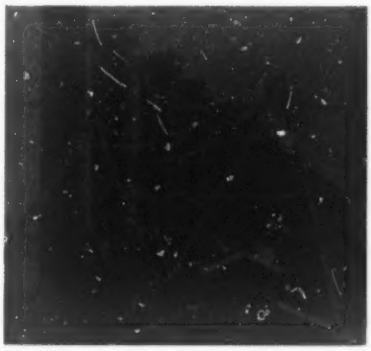
Manufacturing Planbook 1986-87

A Working Tool for Today's Manufacturing Managers

PRODUCTION

MARCH 1986 COVER-TO-COVER VOL. 97 NO. 3



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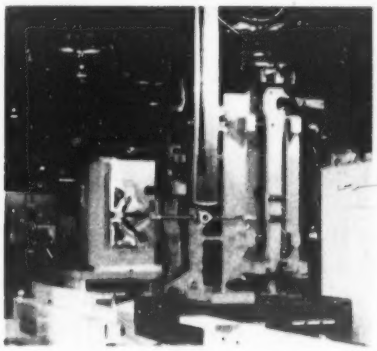

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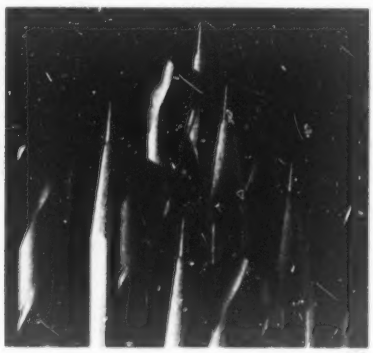

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lines at overseas plants.

–Tools, Dies, Jigs, Fixtures and Contract Machining: Orders and shipments expected to fall as rising imports, the strong dollar and high interest rates continue to cloud the short-term outlook for this industry. Product shipments of tools, dies, jigs and fixtures expected to decrease 3.1 pct after adjustment for inflation.

–Foundry Equipment: Shipments expected to register their second decline in as many years. In real terms, shipments are expected to decline by as much as 6 pct.

–Industrial Heating Equipment: A modest gain in production of the products assuming that user industries—aerospace, electronic, and fabricated metal products—continue to make large capital expenditures for modernization. Shipments and new orders are expected to increase albeit at a slower pace than last year. Industry shipments of industrial heating equipment are projected to rise in constant 1982 dollars, slightly more than 9 pct.

–Power Transformers: The U.S. industry is in serious trouble and is struggling for survival. Transformer industry shipments this year are expected to remain about the same as in 1985. No recovery for producers of large power transformers is expected.

–Motors and Generators: Shipments are expected to show a favorable constant-dollar growth rate this year. Demand for construction and business fixed investment should provide enough stimulus to enable shipments of the motor and generator industry to register a 3 pct rise.

–Industrial Controls: With industrial investment expected to increase, demand should be stimulated resulting in constant-dollar shipments increases at about 4.2 pct more than 1985.

–Autos: Sales are expected to be strong this year, reaching 10.7 million units, slightly above estimated 1985 sales. Domestic car sales are projected to be about 7.5 million units. Import penetration is expected to rise to 29.9 pct this year from 26.4 pct last.

–Railroad Equipment: Shipments, measured in 1982 dollars, should be more than 19 pct higher than last year. Retirement of older equipment coupled with production of new and more efficient cars and locomotives will stimulate purchases by the railroads. Car production is forecast to be 14,500 units while locomotive production should increase to 900.

Machine Tool Picture Mixed In 1985

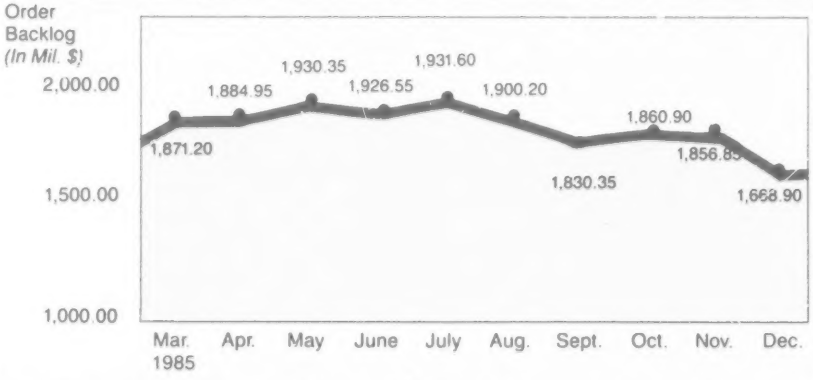
The bottom line was mixed for the machine tool industry in 1985.

Last year's machine tool shipments were up 10.9 pct, but new orders were down 13.2 pct, compared to 1984, according to provisional year-end figures by the National Machine Tool Builders Association (NMTBA).

Machine tool shipments during 1985 totaled $2.54 billion, up from the 1984 final total of $2.29 billion. These results included a rise of 7.8 pct in metal cutting machine tool shipments in 1985, up from $1.61 billion in 1984 to $1.73 billion in 1985. Metal forming machine tool shipments also gained in 1985, up from 1984's $679 million to $804 million.

Machine tool orders totaled $2.53 billion during 1985, down from the 1984 year-end total of $2.92 billion. These figures included a decline of 3.2 pct in new metal cutting machine tool orders in 1985, from $1.92 billion in 1984 to $1.85 billion in 1985. There was also a drop in new metal forming machine tool orders last year, from $1 billion in 1984 to $676 million in 1985.

MACHINE TOOL ORDERS
Backlog



The one-month change from November to December during 1985 showed an 83.3 pct increase in shipments, from $199 million to $365 million. The increase is attributed to the normal year-end accelerated clearance of shipments.

The November/December comparison in new machine tool orders showed a decline of 9.3 pct, from $195 million to $177 million. The industry's order backlog declined from $1.86 billion in November to $1.67 billion in December.

Commenting on the year-end figures, NMTBA President, James A. Gray said: "This regrettable decline in orders for the year reflects the uncertainity of machine tool buyers in light of President Reagan's anti-growth, anti-business tax 'reform' efforts. We are concerned that these tax proposals, the four-year-old recovery, and forecasts of even lower capital spending this year foreshadow continued order decline."

"We lost money in 1984. We will make money in 1985. We will make more money in 1986," he said.

During the past three years, the company's net profits before taxes has increased 200 to 300 pct, Ikari added. His goal for 1986 is to aim for a 30 pct gross profit and a 10 pct net profit.

Mr. Ikari also said U.S. Amada is attempting to perform additional assembly work in California. "We plan to increase production and assembly here," he said. "Our plant is trying to increase the amount of so-called added value work."

He estimated that sales are approaching $10 million per month, with about $4 million worth of equipment assembled domestically. The cost of assembling the equipment in the U.S. is approximately the same as it is in Japan, he added.

Mr. Ikari said Amada's increasing sales, including those in the U.S., have now made the firm the world's largest manufacturer of industrial machine tools.

U.S. Amada also has been attempting to sell American-made machine tools in Japan, including several manufactured by Bridgeport. But the effort has been difficult, Mr. Ikari said because American machines are improperly configured for Japanese operators.

Mr. Ikari said U.S. Amada will expand its sales force on both the east and west coasts to expand the customer base beyond the job shop environment which currently constitues approximately 60 pct of sales.

"We are setting up for a larger company," he said, noting that U.S. Amada began its domestic operations from a smaller "job shop base."

The West Coast show plaza, which was opened in 1982 at a cost of $12 million, spans 100,000 sq. ft. It includes a training center, theater, atrium and 50,000 sq. ft. showroom where the machinery is displayed. There is also a golf course and restaurant.

Potential customers from throughout the country are flown to the facility, which is patterned after Amada's Machine Tool Plaza in Ishhara City, Japan.

—Reported by Al Senia/Los Angeles

EAST

Job Injuries Down; Costs Up

Although the number of disabling injuries to American workers has decreased 24 pct during the past 10 years, the cost of those injuries has tripled, according to a study from the DuPont Company.

Some 2.5 million disabling injuries were reported in 1973 at a cost of $14 billion, which averages out to $5,600 per injury. By 1982, improved safety management helped cut the number of disabling industrial injuries to 1.9 million, but costs skyrocketed to $31.4 billion. The average cost per incident that year was approximately $16,000. In 1983, the same 1.9 million injuries cost $33.4 billion for an average of $17,500, the study pointed out.

Obviously the ever-increasing costs of insurance and medical care are the two most important factors contributing to the rising price tag pertaining to workers' injuries.

Although the number of manufacturing accidents resulting in injury and death continues to decline, increasing costs in medical care and insurance will continue to spur management to intensify its efforts to enhance the safety of machinery and the overall plant environment.

The National Safety Council reported that manufacturing worker fatalities and injuries have steadily decreased from 1980 to 1985. In 1980, out of a total of 19 million manufacturing workers, there were 1,600 fatalities and 450,000 injuries reported. In 1984, there were only 1,100 fatalities and 300,000 injuries out of the 19 million manufacturing workforce.

In a related development, the safety director for GTE-Valeron Corp. has been sentenced to three months in jail and fined $10,000 for lying to an OSHA inspector during an inspection of the company's tungsten carbide tool manufacturing facility in Syracuse, NY.

The fine and sentence is believed to be the first for this type of offense. Under the Occupational Safety and Health Act of 1970, anyone who "knowingly makes a false statement, representation or certification" to OSHA is liable for a fine of up to $10,000 and/or up to six months in jail.

According to OSHA, the safety director informed an inspector that a "rough cut saw" used to grind tools was down for repairs. In fact, the saw had been disabled at his direction to prevent the OSHA compliance officer from obtaining an accurate reading on worker exposure to cobolt and other dust emitted during machine operation, OSHA said.

The safety director pled guilty in his trial before the U.S. District Court for the Northern District of New York.

–Reported by Tom Halligan/Philadelphia

MANUFACTURING INJURIES AND FATALITIES

	Workers	Injuries	Fatalities
1980	19 million	450,000	1,600
1981	20 million	400,000	1,400
1982	19 million	290,000	1,000
1983	19 million	330,000	1,200
1984	19.9 million	300,000	1,100

Source: National Safety Council

What You Need To Know About Capital Spending In 1986

An outlook which allows you to:

Note changing trends and objectives in machinery/equipment purchase and use.

Compare your machinery/equipment investment with others in your industry.

By Edward D. McCallum Jr.
Market Research Consultant

In the fall of 1985, the Research Division of Production Publishing Co. surveyed the 1986 spending plans for machinery/equipment in the metalworking market*. Findings indicate how funds will be invested and reasons for spending. Data are provided in charts and tables which will permit you to determine your plant's competitive manufacturing capability in terms of other plants in your specific industry as well as metalworking manufacturing plants generally.

Spending Plans Remain Flat . . .

Respondents to this year's survey are planning to request $10.7 billion for machinery/equipment and investment. They also report, however, they expect to receive approval for only $8.4 billion. This estimate is used for all projections. Respondents plan to apportion their investments for machinery and equipment as listed in Table A.

Numerical Control

Numerically controlled stand-alone machines will continue to capture a large share capital investment in the next three years according to the survey. Of the total, 56.7 pct of the respondents plan purchase over the next three years and about two of three respondents report use of CNC equipment. Of the total 65.9 pct of the plants planning CNC equipment purchase will spend 42.5 pct of their total capital funds with offshore sources with a majority of these investments directed to turning machines, machining centers and punching machines.

Table B indicates the types of CNC machines respondents plan to purchase over the next three years.

Over 50 pct of all CNC purchase activity is accounted for by a small number of industries. Table C illustrates industries that are most active in the purchase of different CNC equipment.

Offshore Sourcing

Of the total respondents 58.3 pct report they will purchase 40 pct of their 1986 capital equipment requirements from offshore sources. Of these respondents: 56.7 pct plan offshore metalcutting machine purchases; 14.7 pct plan metalforming purchases; 14.6 pct plan gaging-inspection-testing equipment purchases; and 24.8 pct other equipment purchases including assembly equipment, joining equip-

Table A

How Plants are Spending

Machine/Equipment	Pct Total Investment 1986	Total Projection (Mil$)	Pct Change 1986 from 1981-1985 Average
Metalcutting	38.5	3245*	+ 4.0
Assembly	11.4	961	−21.3
Other	11.4	961	+40.7
Metalforming	11.2	944**	− 2.7
Gaging/Inspection/Testing	7.2	606	+16.1
Cleaning/Finishing	6.5	547	−11.0
Material Handling	5.2	438	− 8.7
Weld/riveting/brazing	4.0	337	−18.4
Plastic Molding	2.6	219	Same
Heat Processing	2.0	168	−16.7

*$1931 million to be sourced domestically
**$642 million to be sourced domestically

*Survey scope: *Plants reached by PRODUCTION Magazine in Fabricated Metal Products (SIC 34); Machinery, except Electrical (SIC 35); Electrical Machinery (SIC 36); Transportation Equipment (SIC 37); Instruments (SIC 38) and selected portions of Furniture -metal (SIC 25) in plants employing 20 or more persons. 1986 figures are projected from 2,017 respondents from 12,000 plants contacted in keeping with past procedures. See January, 1986 issue of PRODUCTION Magazine for other capital spending details not included in this presentation.*

Table B

Percent of Respondents Planning CNC Purchase

Equipment Type	1986*	1986**	1986-88*	1986-88***
Machining Center-Horiz.-Y axis -27"	10.7	18.8	14.1	24.8
Machining Center-Horiz.-Y axis +27"	6.5	11.4	10.8	19.1
Machining Center-Vert-Y axis −20"	9.0	15.9	12.6	22.2
Machining Center-Vert-Y axis +20"	6.5	11.4	10.3	18.2
Turning Horiz.-Less than 13" chuck	15.7	27.7	20.7	36.4
Turning Horiz.-More than 13" chuck	5.5	9.6	8.9	15.6
Turning Vert-Less than 30" dia table	2.1	3.6	2.7	4.8
Turning Vert-More than 30" dia table	1.7	2.9	3.0	5.2
Boring	4.3	7.5	6.1	10.8
Drilling	5.9	10.4	8.5	14.9
Grinding	8.3	14.6	12.0	21.2
Milling	7.1	12.5	11.0	19.3
Punching	4.3	7.5	7.2	12.7

*Base: 2,017-Total Respondents
**Base: 1,144-Respondents Planning CNC Purchase
***Base: 1,144-Respondents Planning CNC Purchases

ment, plastic molding and heat processing equipment. Industries planning major investment with offshore sources are listed in Table D.

Lasers

Lasers appear to be more readily applied in larger plants, 86.1 pct of those respondents planning purchase are located in plants employing 100 or more persons; almost half (47.7 pct) in plants employing 500 or more. About half of the respondents planning laser purchase over the next three years indicated laser type. Of these: 49.6 pct plan CO_2 purchase, 40.3 pct plan YAG and 36.2 pct plan helium-neon powered lasers. Major laser purchase activity is centered in the following industry groups; individual industries (SICs) showing important activity are indicated in Table E.

Cells and Systems

Cell and system usage, as reported by respondents, continues to grow, albeit slowly. Approximately 50 pct of the respondents that reported use of cells and/or systems (FMS) are located in a half dozen industries (SICs). The

Table C

Major Purchases of CNC Equipment by Type

Equipment Type	Most Active Purchasing Industries 1986-88
Machining centers, Horiz., less than 27" Y axis	51.4 pct of respondents planning purchase are located in: Miscellaneous fabricated metal products (SIC 349), metalworking machinery and equipment (SIC 354), general industries machinery (SIC 356), miscellaneous machinery, electrical (SIC 359), aircraft and parts (SIC 372), and measuring and controlling instruments (SIC 382).
Machining centers, Horiz., more than 27" Y axis	69.7 pct of respondents planning purchase are located in: Miscellaneous fabricated metal products (SIC 349), engines and turbines (SIC 351), construction, mining, oil field and material handling equipment (SIC 353), metalworking machinery and equipment (SIC 354), special industry machinery (SIC 355), general industrial machinery (SIC 356), miscellaneous machinery, exc. electrical (SIC 359), and aircraft and parts (SIC 372).
Machining centers, Vert., less than 20" Y axis	65.3 pct of respondents planning purchase are located in: Miscellaneous fabricated metal products (SIC 349), metalworking machinery and equipment (SIC 354), general industrial machinery (SIC 356), miscellaneous machinery, exc. electrical (SIC 359), motor vehicles, motor vehicle parts (SIC 371), aircraft and parts (SIC 372), and measuring and controlling instruments (SIC 382).
Machining centers, Vert., more than 20" Y axis	66.8 pct of respondents planning purchase are located in: Miscellaneous fabricated metal products (SIC 349), construction, mining, oil field and material handling equipment (SIC 353), metalworking machinery and equipment (SIC 354), special industrial machinery (SIC 355), general industrial machinery (SIC 356), miscellaneous machinery, exc. electrical (SIC 359), aircraft and parts (SIC 372).
Turning, Horiz., less than 13" chuck	64.9 pct of respondents planning purchase are located in: Screw machines products (SIC 345), miscellaneous fabricated metal products (SIC 349), construction, mining, oil field and material handling (SIC 353), metalworking machinery, exc. electrical (SIC 354), general industrial machinery (SIC 356), miscellaneous machinery, exc. electrical (SIC 359), motor vehicles, motor vehicles parts (SIC 371), and aircraft and parts (SIC 372).
Turning, Horiz., more than 13"chuck	68.1 pct of respondents planning purchase are located in: Miscellaneous fabricated metal products (SIC 349), construction, mining, oil field and material handling (SIC 353), metalworking machinery and equipment (SIC 354), general industrial machinery (SIC 356), miscellaneous machinery, exc. electrical (SIC 359), motor vehicles, motor vehicles parts (SIC 371) and aircraft and parts (SIC 372).
Turning, Vert., less than 30" dia table	56.3 pct of respondents planning purchase are located in: Metalworking machinery and equipment (SIC 354), general industrial machinery (SIC 356), miscellaneous machinery, exc. electrical (SIC 359), motor vehicles, motor vehicles parts (SIC 371), and aircraft and parts (SIC 372).

same situation exists in planned usage of cells and/or systems where a half dozen industries will account for half of the planned activity over the next three years.

We have displayed use and planned purchase activity for both cells and systems, as reported by respondents to the survey, in Table F.

Important Note: A manufacturing cell was defined in the survey as comprising one material handling device servicing multiple machines of which both are coordinated and paced by a computer or programmable controller. A flexible manufacturing system (FMS) was defined as comprising multiple materials handling devices servicing multiple machines with a computer responsible for coordinating, pacing and scheduling.

Robotics

Of the respondents, 34.5 pct report that they plan purchase of robotic devices between now and 1988. While that total decreased 2.4 pct from last year, it reflects installations over the past few years and the need to spend some time to determine how to better use these productivity assists. Noteworthy is the fact that 88 pct of the respondents that intend to purchase robots over the next three years employ 100 or more persons. A majority of robotic investment is made along with new purchases of machinery and equipment for manufacturing and assembly operations. Tie-ins with manufacturing cells and systems are obvious.

Other investment is not. Table G indicates the percent of respondents who plan robot usage or content in their anticipated purchases of production or assembly equipment.

Computers and Computerized Data Systems

Approximately four of five respondents plan to apply computers in their manufacturing operations over the next three years. While most of this activity will occur in plants employing 100 or more persons, 56.9 pct of those plants planning to install or expand the use of computers in manufacturing are located in plants employing 50-500. Only 16.6 pct in plants employing less than 50 persons.

Planned applications of computers in manufacturing are concentrated plant employment-wise in Table H.

Equipment Type	Most Active Purchasing Industries 1986-88
Turning, Vert., more than 30" dia table	65.0 pct of respondents planning purchase are located in: Engines and turbines (SIC 351), metalworking machinery and equipment (SIC 354), general industrial machinery (SIC 356), miscellaneous machinery, exc. electrical (SIC 359), aircraft and parts (SIC 372), and general missiles and space vehicles.
Boring	65.8 pct of respondents planning purchase are located in: Engines and turbines (SIC 351), construction, mining, oil field, and material handling (SIC 353), metalworking machinery and equipment (SIC 354), general industrial machinery (SIC 356), miscellaneous machinery, exc. electrical (SIC 359), electrical industrial apparatus (SIC 362), motor vehicles, motor vehicles parts (SIC 371), aircraft and parts (SIC 372), and general missiles and space vehicles (SIC 367).
Drilling	63.1 pct of respondents planning purchase are located in: Fabricated structural steel (SIC 344), miscellaneous fabricated metal products (SIC 349), metalworking machinery and equipment (SIC 354), special industry machinery (SIC 355), general industrial machinery (SIC 359), motor vehicles, motor vehicles parts (SIC 371), aircraft and parts (SIC 372).
Grinding	74.7 pct of respondents planning purchase are located in: Miscellaneous fabricated metal products (SIC 349), engines and turbines (SIC 351), construction, mining, oil field and material handling (SIC 353), metalworking machinery and equipment (SIC 354), special industrial machinery (SIC 355), general industrial machinery (SIC 356), miscellaneous machinery, exc. electrical (SIC 359), motor vehicles, motor vehicles parts (SIC 371), aircraft and parts (SIC 372).
Milling	67.8 pct of respondents planning purchase are located in: Cutlery, hand tools, hardware (SIC 342), engines and turbines (SIC 351), construction, mining, oil field and material handling (SIC 353), metalworking machinery and equipment (SIC 354), general industrial machinery (SIC 356), miscellaneous machinery, exc. electrical (SIC 359), electrical lighting and equipment (SIC 364), electrical component (SIC 367), motor vehicle, motor vehicles parts (SIC 371), and aircraft and parts (SIC 372).
Punching	54.4 pct of respondents planning purchase are located in: Metal, office furniture (SIC 252), fabricated structural steel (SIC 344), Forging and stamping (SIC 346), miscellaneous fabricated metal products (SIC 349), farm and garden machinery (SIC 352), construction, mining, oil field and material handling (SIC 353), special industry machinery (SIC 355), communications equipment (SIC 366), and motor vehicles and motor vehicles parts (SIC 371).

Table D

SIC	Industry	Pct Total Respondents Planning Offshore Sourcing	Pct of Appropriation Going Offshore
3429	Hardware, nec	69	34.3
3443	Fabricated plate work	33	45.0
3451	Screw machine products	50	53.6
3452	Bolts, nuts, rivets, washers	55	45.0
3469	Metal stampings, nec	51	36.4
3494	Valves and pipe fittings	55	41.1
3531	Construction machinery	71	43.3
3533	Oil field machinery	79	36.6
3541	Metalcutting machine tools	51	46.8
3544	Dies, tools, jigs, molds	53	49.4
3545	Machine tool accessories	55	56.1
3551	Food products machinery	65	40.1
3559	Special industry machinery, nec	44	49.2
3561	Pumps and pumping equipment	66	38.2
3562	Ball and roller bearings	67	37.1
3566	Speed changers, drives and gears	64	56.8
3569	General industrial machinery, nec	51	48.9
3599	Machinery, except electrical, nec	51	64.0
3621	Electric motors	65	41.2
371	Motor vehicles, motor vehicle parts	55	26.6
3724	Aircraft engines	76	41.5
3728	Aircraft parts	71	36.5
3811	Engineering and scientific instruments	58	46.8
382	Measuring and controlling instruments	62	31.6
384	Medical, dental and surgical instruments	63	34.5

Table E

SIC	Industry	Pct of Respondents Planning Laser Purchase
34	**Fabricated metal products** Major purchase activity: Metal stamping (SIC 346), value and pipe fitting (SIC 3494)	13.2
35	**Machinery exc. electrical** Major purchase activity: Metalcutting machine tools (SIC 3541), tool and die (SIC 3544), machine tool accessories special industry machinery (SIC 355) general machinery (SIC 356) machines (SIC 357), miscellaneous machinery, exc. electrical (SIC 359)	34.4
36	**Electrical machinery** Major purchase activity: Electric motors (SIC 3621), industrial controls (SIC 3622), communications equipments (SIC 366), electron components (SIC 367).	19.5
37	**Transportation equipment** Major purchase activity: Motor vehicles, motor vehicles parts (SIC 371), aircraft and parts (SIC 372).	17.9
38	**Instruments** Major purchase activity: Measuring and controlling instruments (SIC 382), medical, dental and surgical instruments (SIC 384).	9.9

Table G

Of the Total Respondents Investing in	Pct Whose Purchase Includes Robotics
Metalcutting machine tools	13.0
Metalforming machines	10.9
Cleaning/finishing equipment	12.9
Assembly machines-equipment	29.3
Welding/riveting/brazing equipment	23.9
Heat processing equipment	6.8
Gaging/inspection/testing equipment	6.6
Material handling equipment	14.4
Plastic molding equipment	20.9

Table H

Computer Application	Planned Use Concentration by Plant Employment
Production control	Plants employing 50-500
Shop floor control	Plants employing 50-500
Machine loading	All sized respondent plants
Materials requirement planning	Plants employing 50-500 **NOTE: Most large plants (500+) have installed systems.**
Maintenance scheduling	All sized respondent plants
CAD/CAM	Plants employing 100 or more

Table F
Use and Planned Purchases-Cells

SIC	Industry	Cell Use Base: 254	Cell Purchase 86-88, Base: 389	System Use Base: 172	System Purchase 86-88, Base: 314
252	Metal office furniture	4	6	3	7
342	Cutlery, hand tools hardware	11	12	6	12
343	Heating equipment, exc electric and plumbing fixtures	7	8	-	-
344	Fabricated structural steel products	12	15	6	8
346	Forging and stampings	13	12	6	8
349	Misc. fabricated metal products	16	29	14	22
351	Engines and turbines	4	9	2	5
352	Farm and garden machinery	13	9	2	6
353	Construction, mining, oil fields & material handling equipment	8	13	8	11
354	Metalworking machinery and equipment	22	25	16	21
355	Special industry machinery	3	13	4	10
356	General industrial machinery and equip.	22	48	16	26
357	Office, computing and accounting machinery	7	9	9	7
359	Misc. machinery, exc. electrical	10	14	6	11
362	Electrical industrial apparatus	7	13	6	12
363	Household appliance	4	5	-	6
364	Electrical lighting wiring equipment	5	9	3	10
366	Communications equip.	5	11	6	12
367	Electronic Components	13	16	11	14
371	Motor vehicles, motor vehicles parts	23	33	14	24
372	Aircraft and parts	5	20	5	17
382	Measuring and controlling instruments	6	14	7	13
	Group Totals	**220**	**333**	**150**	**263**
	Pct of Base	**86.6%**	**85.6%**	**87.2%**	**83.7%**

Spending Patterns

For each of the nine production equipment categories shown below, the industries that are listed account for the bulk of the total 1986 investment by respondents in that type of equipment. Industries that are not listed are not making significant investments in equipment of that type according to respondents.*

Compare your company's investment pattern with your industry's spending plans by evaluating the percentage of capital investment budget that will be spent for each of these equipment categories.

**Note: These industries account for 75 pct or more of the planned investment for these types of equipment according to the PRODUCTION Magazine.*

Weld/Rivet/Braze Equipment

SIC	Industry	Pct of Reported Investment in Category
252	Metal office furniture	17.2
253	Public building and related furniture	17.3
254	Metal partitions and fixtures	4.7
343	Heating equipment, except electric and plumbing fixtures	4.8
344	Fabricated structural steel products	10.4
346	Forgings and stampings	3.6
348	Ordnance and accessories	3.5
349	Misc. fabricated metal products	4.7
351	Engines and turbines	3.7
352	Farm and garden machinery	8.9
353	Construction, mining, oil field and material handling equipment	9.3
355	Special industry machinery	4.7
356	General industrial machinery and equipment	3.1
358	Refrigeration and service industry machinery	7.3
361	Electrical transmission and distribution equipment	4.6
363	Household appliances	2.8
364	Electrical lighting and wiring equipment	6.6
371	Motor vehicles, motor vehicle equipment	5.9
372	Aircraft and parts	5.3
374	Railroad equipment	6.3
376	Guided missiles, space vehicles and parts	3.0
379	Transportation equipment, n.e.c.	14.0
382	Measuring and controlling instruments	4.2
384	Surgical, medical and dental instruments and supplies	3.9
386	Photographic equipment	12.5

Cleaning/Finishing Equipment

SIC	Industry	Pct of Reported Investment in Category
252	Metal office furniture	18.4
253	Public building and related furniture	19.1
254	Metal partitions and fixtures	12.3
341	Metal containers	9.6
342	Cutlery, hand tools, hardware	12.5
343	Heating equipment, except electric and plumbing fixtures	11.9
345	Screw machine products	8.3
346	Forgings and stampings	5.7
348	Ordnance and accessories	9.3
349	Misc. fabricated metal products	8.4
351	Engines and turbines	6.6
352	Farm and garden machinery	20.2
353	Construction, mining, oil field and material handling equipment	6.4
358	Refrigeration and service industry equipment	6.0
361	Electrical transmission and distribution equipment	8.4
364	Electrical lighting and wiring equipment	10.3
367	Electronic components and accessories	10.7
369	Misc. electrical machinery, equipment, supplies, n.e.c.	7.6
371	Motor vehicles, motor vehicle equipment	9.9
372	Aircraft and parts	7.2
374	Railroad equipment	23.0
376	Guided missiles, space vehicles and parts	9.1
381	Engineering, laboratory, scientific and research instruments	7.8

Metalcutting Machine Tools

SIC	Industry	Pct of Reported Investment in Category
345	Screw machine products	62.7
348	Ordnance and accessories	64.9
349	Misc. fabricated metal products	45.3
351	Engines and turbines	58.6
353	Construction, mining, oil field and material handling equipment	46.9
354	Metalworking machinery and equipment	72.1
355	Special industry machinery	57.0
356	General industrial machinery and equipment	56.9
359	Misc. machinery, exc. electrical	76.3
362	Electrical industrial apparatus	38.6
371	Motor vehicles, motor vehicle equipment	32.4
372	Aircraft and parts	61.3
374	Railroad equipment	33.4
381	Engineering, laboratory, scientific research instr	38.6
386	Photographic equipment	40.0

Heat Processing Equipment

SIC	Industry	Pct of Reported Investment in Category
342	Cutlery, hand tools, hardware	2.9
344	Fabricated structural steel products	1.8
345	Screw machine products	3.3
351	Engines and turbines	3.0
353	Construction, mining, oil field and material handling equipment	3.2
354	Metalworking machinery and equipment	1.5
356	General industrial machinery and equipment	3.4
357	Office, computing and accounting machinery	2.4
361	Electrical transmission and distribution equipment	3.8
362	Electrical industrial apparatus	1.8
363	Household appliances	2.0
371	Motor vehicles, motor vehicle equipment	1.6
372	Aircraft and parts	5.6
374	Railroad equipment	3.8
376	Guided missiles, space vehicles and parts	2.6
383	Optical instruments and lenses	10.8

Material Handling Equipment

SIC	Industry	Pct of Reported Investment in Category
252	Metal office furniture	11.8
253	Public building and related furniture	7.5
254	Metal partitions and fixtures	8.9
342	Cutlery, hand tools, hardware	9.3
344	Fabricated structural steel products	11.7
351	Engines and turbines	8.9
353	Construction, mining, oil field and material handling equipment	7.5
357	Office, computing and accounting machinery	12.1
362	Electrical industrial apparatus	6.1
363	Household appliances	10.4
365	Radio and TV sets	9.8
366	Communication equipment	7.0
369	Misc. electrical machinery, equipment, supplies, n.e.c.	14.7
371	Motor vehicles, motor vehicle equipment	5.8
384	Surgical, medical and dental instruments and supplies	9.1

Gaging/Inspection/Testing Equipment

SIC	Industry	Pct of Reported Investment in Category
345	Screw machine products	8.3
348	Ordnance and accessories	9.2
351	Engines and turbines	8.8
354	Metalworking machinery and equipment	8.3
355	Special industry machinery	8.6
356	General industrial machinery and equipment	7.0
357	Office, computing and accounting machinery	20.3
359	Misc. machinery, exc. electrical	9.5
361	Electrical transmission and distribution equipment	5.4
362	Electrical industrial apparatus	7.0
365	Radio and TV sets	8.8
366	Communication equipment	9.1
367	Electronic components and accessories	9.1
369	Misc. electrical machinery, equipment, supplies, n.e.c.	7.8
371	Motor vehicles, motor vehicle equipment	7.5
372	Aircraft and parts	7.2
381	Engineering, laboratory, scientific and research instruments	17.4
382	Measuring and controlling instruments	11.0
383	Optical instruments and lenses	15.7
384	Surgical, medical and dental instruments and supplies	10.2

Plastic Molding Equipment

SIC	Industry	Pct of Reported Investment in Category
341	Metal containers	17.0
342	Cutlery, hand tools, hardware	2.7
343	Heating, equipment, except electric and plumbing fixtures	6.4
344	Fabricated structural steel products	1.5
346	Forgings and stampings	3.0
349	Misc. fabricated metal products	2.0
355	Special industry machinery	2.8
358	Refrigeration and service industry machinery	3.5
361	Electrical transmission and distribution equipment	6.3
362	Electrical industrial apparatus	4.4
364	Electrical lighting and wiring equipment	7.5
365	Radio and TV sets	3.9
366	Communication equipment	2.1
367	Electronic components and accessories	5.2
369	Misc. electrical machinery, equipment, supplies, n.e.c.	6.5
371	Motor vehicles, motor vehicle equipment	1.5
379	Transportation equipment, n.e.c.	22.0
382	Measuring and controlling instruments	4.2
383	Optical instruments and lenses	7.2
384	Surgical, medical and dental instruments and supplies	6.1
386	Photographic equipment	10.0

Capital Spending

Assembly Equipment

SIC	Industry	Pct of Reported Investment in Category
341	Metal containers	20.6
342	Cutlery, hand tools, hardware	15.0
357	Office, computing and accounting machinery	26.7
358	Refrigeration and service industry machinery	11.4
361	Electrical transmission and distribution equipment	36.6
362	Electrical industrial apparatus	19.1
363	Household appliances	19.8
364	Electrical lighting and wiring equipment	22.0
365	Radio and TV sets	53.9
366	Communication equipment	31.7
367	Electronic components and accessories	28.0
369	Misc. electrical machinery, equipment, supplies, n.e.c.	32.5
371	Motor vehicles, motor vehicle equipment	17.0
381	Engineering, laboratory, scientific and research instruments	17.4
382	Measuring and controlling instruments	26.5
383	Optical instruments and lenses	28.9
384	Surgical, medical and dental instruments and supplies	16.3
386	Photographic equipment	24.2

Metal Forming Machinery and Equipment

SIC	Industry	Pct of Reported Investment in Category
252	Metal office furniture	30.5
253	Public building and related furniture	23.9
254	Metal partitions and fixtures	59.7
341	Metal containers	45.7
342	Cutlery, hand tools, hardware	19.0
343	Heating equipment, exc. electric and plumbing fixtures	25.8
344	Fabricated, structural steel products	31.4
345	Screw machine products	12.0
346	Forgings and stampings	44.9
352	Farm and garden machinery	28.9
353	Construction, mining, oil field and material handling equipment	15.0
358	Refrigeration and service industry machinery	29.3
363	Household appliances	14.1
364	Electrical lighting and wiring equipment	18.8
371	Motor vehicles, motor vehicle equipment	13.1
379	Misc. transportation equipment, n.e.c.	29.0

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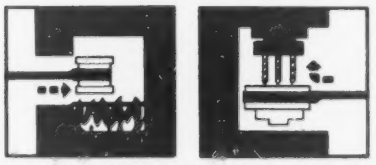

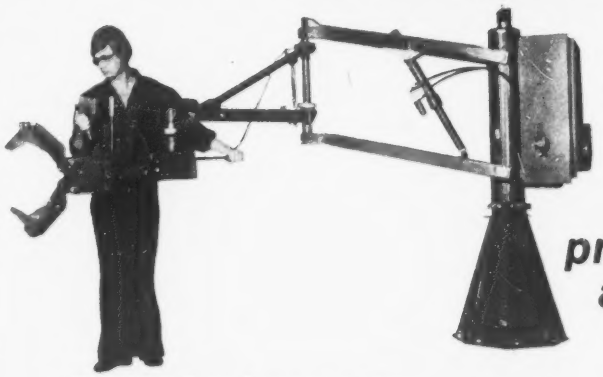

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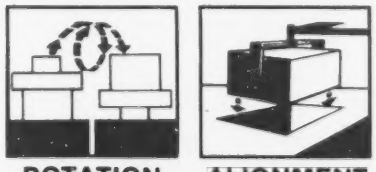

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